CONTROLLING POTATO STORAGE ROTS

by
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There are two basic types of rot which causes breakdown in potato storages: those which break down and produce liquids (wet rot) and those which do not (dry rots). Wet rots produce large quantities of water which move further down into the pile. Wet rots are particularly important because of the effect that any water has in a potato storage. When the surface of the potatoes are wet to the touch they are completely surrounded by a film of water. This film can be only one or two molecules deep and still have the same effect as soaking the tuber entirely in water. The water becomes a barrier between the potato and the air, cutting off the flow of oxygen to the tissues of the tuber. Under these conditions the tissues in the potatoes become oxygen deficient.

The organisms which causes Soft Rot and Black Leg of potatoes are Erwinia carotovora var. carotovora and Erwinia carotovora var. atrospetica. They are organisms which do not require oxygen in order to reproduce and spread. They have alternate metabolic pathways which can supply the bacterium energy without the presence of oxygen. When potato tubers are wet on the surface and these bacteria are on or in the potato tubers, they have a competitive advantage. The bacteria can grow rapidly while the potato tuber has difficulty even staying alive. The bacteria moves rapidly and will rot in those tubers in which it is present. The water from this process begins to run through the pile carrying the bacteria to other tubers and wetting them, cutting off their oxygen supply.

What about other storage rots? Do they spread in this water through the pile? The answer is generally no. Most storage rot diseases do not have the ability to spread from one tuber to another in storage unless there are unhealed wounds. When the tubers come in from the field they are already infected with storage rot and only the tubers infected rot while in storage. Storage conditions affect the rate of rot development in these tubers that were infected in the field. The organisms which causes Bacterial Soft Rot and Black Leg have some ability to spread in storage. However, they are usually widespread in the tubers and when conditions become favorable they can cause decay immediately. Even in the most severe rot situation some tubers will survive intact, even in the middle of a large rot pocket. Control of storage rots can be cut down to three essentials: One: Keep all pathogens possible out of the potato storage by proper treatment of the potatoes in the field. Two: Drop temperature as rapidly as possible, consistent with wound healing and the purpose for which the potatoes will ultimately be used. This prevents the development of rots from field infections. Three: Provide adequate oxygen to the tubers so the Bacterial Soft Rot does not have the chance to spread. The most important step is to prevent the formation of free water on the surface of the tubers. When free water is present every effort should be made to remove it as quickly as possible.

Individual Storage Rots

A. Dry Rots

In the Columbia Basin there are two principle storage dry rots. The first and most common of these is Fusarium Dry Rot, caused by a number of species of the fungal organism Fusarium. This rot always enters the tubers through wounds. The best means of control is to prevent wounds on the tubers by careful handling procedures and allowing adequate time between death of the vines and harvest. An alternative method of control when wound tubers must be placed in storage is the use of the chemical Mertect applied as a spray to the potatoes as they enter storage. This fungicide does an excellent job of controlling Fusarium Dry Rot. However, care must be taken to dry the water that has been applied as soon as tubers enter storage or bacterial soft rot can develop.

A second dry rot which is seen less often in the Columbia Basin area is Early Blight caused by Alternaria solani. The dry rot lesions of this disease are about the size of a pencil eraser. The fungus does not infect until immediately prior to storage and like the Fusarium organism it has the ability to infect wounds. However, the greatest number of infections occur directly through the skin of the tuber. Most of the infection occurs when tubers are put into storage wet. The fungal spores germinate on the surface of the tuber and enter the tuber directly through the skin. The best means of control is to either avoid harvesting tubers under cold, wet conditions, or if this is impossible, to completely dry the surface of the tubers by forcing air through the pile when they are put into the storage. Tubers that are not mature are more susceptible than mature tubers.

B. Wet Rots

Bacterial ring rot is one of the diseases that causes wet rot in storage. Eventually tubers with this disease break down and water moves through the pile. The disease does not have the ability to move to uninfected tubers in storage, except through wounds. It destroys the tubers that were infected prior to harvest producing water which promotes bacterial soft rot. Bacterial ring rot can be minimized by utilizing certified seed and by taking proper sanitary procedures such as cleaning equipment between seed lots and as frequently as possible when using the same seed lot. If a lot of potatoes are known to be infected with bacterial ring rot, it should be shipped or processed as soon as possible. If it is necessary to store potatoes that are infected with bacterial ring rot allow the potatoes to remain in the field as late in the season as possible. Under high temperature conditions many of the bacterial ring rot infected tubers break down in the field and hence are not placed in storage.

Late Blight

The fungus, Phytophthora infestans, is the cause of Late Blight, and also causes a wet rot of tubers. This disease is introduced into the tubers before or at harvest time. When the potato tubers are dug, the spores of the Late Blight fungus gets on the potato tubers and it may infect them if moisture is present. The best means of controlling the storage phase of this disease is to allow two weeks between the death of all green tissue on the vines and harvest. During this time the spores of the organism die and even if they do come in contact with the tubers they are unable to infect.

Leak

Leak, caused by Pythium sp., is another fungal disease that causes wet rot in storage. No good control measures have been worked out to reduce this disease except reducing the temperature of the potato pile as rapidly as possible.

Pink Water Rot (or Western Leak)

Water rot caused by Phytophthora sp. is the major fungal disease that contributes to the potato storage rot complex we see in this area. This fungus does not move in storage but frequently causes breakdown of a large number of tubers that were infected in the field. This process releases large quantities of water which promotes bacterial soft rot. The only control measure is proper use of irrigation water. When excessive water is present in the field the disease infects the tubers. Particularly critical in control of this disease are the last two or three weeks of the irrigation season just prior to harvest. Another measure that has helped storage rots caused by Pink Water Rot is to pick out as many of the infected tubers as possible at the time they enter storage.

How to Store Potatoes for Minimum of Bacterial Soft Rot in Storage

1. Buy seed that is checked for Black Leg or from a stem cutting program.

2. Use a seed-piece treatment.

3. Allow the tubers sufficient time for maturity in the field prior to the time of harvest.

4. Taper off irrigation toward the end of the year so that vines are not given more water than they can use.

5. While harvesting the tubers minimize bruise damage as much as possible.

6. When placing tubers into storage if they are wet dry air must be run through those portions of piles that are completed so that the free water is dried up. Once the storage is completely filled with tubers that are dry on the surface the humidification equipment may be turned on. Tubers should be allowed a curing period in order for wounds to heal. However, the length of this period should be kept to a minimum and humidification equipment should not be turned on until such time as the surface of the tubers are dry.

7. Temperature of the pile should be dropped as rapidly as is possible and still maintain the quality desired. If tubers are cool when placed into storage and outside temperature is warm, don't trust your automatic equipment to put air into the storage. If tuber temperature is cooler than the outside temperature the equipment will not run air through the pile. The air flow in the pile should be adjusted so that there is air being pushed through the pile during the first two weeks so no hot spots develop.

8. Do not allow rocks, dirt, grass, etc. to get into the potato storage since this prevents the flow of air through the pile.

9. Do not add air which is warmer than pile temperatures since this causes condensation from the air, allowing water to form thus promoting Bacterial Soft Rot.